MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

BDS 4614 – MANAGEMENT DECISION SCIENCE

(All sections / Groups)

23 OCTOBER 2017
9 a.m - 12 p.m
(3 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **FIVE (5)** pages with **FIVE (5)** Questions only, inclusive of a normal distribution table.

2. Answer **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

QUESTION 1 [20 Marks]

A contractor is planning to build a new housing development consisting of colonial, split-level, and ranch-style houses. A colonial house requires ½ acres of land, $60,000 capital and 4,000 labor hours to construct and returns a profit of $20,000. A split-level house requires ½ acres of land, $60,000 capital and 3,000 labor hours to construct and returns a profit of $18,000. A ranch house requires 1 acre of land, $80,000 capital, 4,000 labor-hours to construct and returns a profit of $24,000. The contractor has available 30 acres of land, $3,200,000 capital and 180,000 labor-hours.

a) Formulate the above problem as a Linear programming problem. **[4 marks]**

b) Set up the initial simplex tableau for the above linear programming problem. **[5 marks]**

Given the following final tableau

C_j →		20000	18000	24000	0	0	0	
	Solution Mix	X_1	X_2	X_3	S_1	S_2	S_3	Quantity
24000	X_3	0	0	1	3	0	0	10
18000	X_2	0	1	0	-4	0.001	-0.001	20
20000	X_1	1	0	0	0	-0.0001	0.001	20
	Z_j	20000	18000	24000	0	0.2	2	1,000,000
	$C_j - Z_j$	0	0	0	0	-0.2	-2	

S_1 – slack for total acres of land available
S_2 – slack for total capital
S_3 – slack for total labor hours available

c) Determine the optimal number of houses of each type that should be built and the maximum profit. **[4 marks]**

d) Determine the dual price of labor hours available and discuss the effect of increasing the labor hours on total profit. **[2 marks]**

e) Determine the range of optimality for the profit contribution rate of split-level house. **[3 marks]**

f) Determine the range for the right hand side of the third constraint without changing the dual price. **[2 marks]**

Continued...

QUESTION 2 [20 Marks]

a) Coal is mined and processed at four mines and supplied to utility power plants at three cities. The railroad shipping costs (in thousands of dollars) per ton of coal are shown in the following table:

From	To			SUPPLY
	1	2	3	
A	8	5	6	90
B	15	10	12	70
C	12	9	11	90
D	9	11	7	100
DEMAND	120	120	110	

Determine the initial solution using the Northwest corner method and then obtain optimal production plan by using the Stepping stone method.

[11 marks]

b) Consider the assignment problem having the following cost table:

Assignee	Task			
	1	2	3	4
A	$8	6	5	7
B	6	5	3	4
C	7	8	4	6
D	6	7	5	6

Determine the optimal assignment and compute the total minimum cost.

[9 marks]

Continued....

QUESTION 3 [20 Marks]

An architect is in the process of building a bungalow. Some of the information on the activities is shown in the following table:

Activity	Description	Days			Immediate Predecessors
		Optimistic	Most likely	Pessimistic	
A	Bonding, insurance, tax structuring	20	30	40	---
B	Foundation, concrete footing	20	65	80	A
C	Upgrading balcony	50	60	100	A
D	Upgrading walkways, stairwells	30	50	100	C
E	Interior wiring, lathes	25	30	35	B
F	Inspection approvals	1	1	1	E
G	Plumbing	25	30	35	D, E
H	Painting	10	20	30	G
I	Hardware/air conditioning/metal workings	20	25	60	H
J	Tile/carpeting/windows	8	10	12	H
K	Inspection	1	1	1	J
L	Final detail work/cleanup	20	25	60	I, K

a) Construct a network for this problem. **[6 marks]**

b) Determine the expected time and variance for each activity. **[4 marks]**

c) Determine ES, EF, LS, LF, and slack for each activity. **[5 marks]**

d) Determine the critical path and project completion time. **[2 marks]**

e) Determine the probability that the project will be finished in 270 days or less. **[3 marks]**

Continued....

QUESTION 4 [20 Marks]

Home Supply Co. specializes in manufacturing household gadgets. It is considering building a large, medium or small shop to produce the components. The table below shows the payoffs for a proposed facility under three market conditions (strong, fair and poor markets):

Alternative	States of Nature		
	Strong Market (RM)	Fair Market (RM)	Poor Market (RM)
Large Shop	850	600	250
Medium Shop	600	500	450
Small Shop	400	400	350
Probability	0.3	0.6	0.1

Determine the best decision, using the following decision criteria:

a) Maximax **[2 marks]**
b) Maximin **[2 marks]**
c) Hurwicz criterion of realism ($\alpha = 0.4$) **[4 marks]**
d) Equally Likely **[3 marks]**
e) Minimax regret **[5 marks]**
f) Expected Monetary Value **[4 marks]**

QUESTION 5 [20 Marks]

A consulting firm is trying to determine how to minimize the costs associated with purchasing paper. Paper is consumed at the rate of 30 reams per year. Each time an order is placed an ordering cost RM100 is incurred and the holding cost per ream per year is 1% of the unit purchase cost. The purchasing cost per ream is RM12.

a) What is the Economic Quantity Order? **[5 marks]**

b) What is the average inventory? **[3 marks]**

c) What is the annual holding cost? **[3 marks]**

d) How many orders per year would be placed? **[2 marks]**

e) What is the annual ordering cost? **[2 marks]**

f) What is the total annual inventory cost? **[5 marks]**

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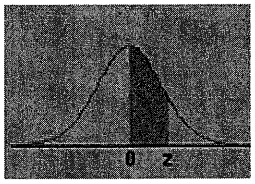

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974

Normal Distribution Table

End of paper